International Journal of
HEAT and MASS TRANSFER

Editors/Co-Editors

**J. GOSSE, U. GRIGULL, E. HAHNE, J. P. HARTNETT,
O. G. MARTYNENKO, W. J. MINKOWYCZ,
D. B. SPALDING, I. TANASAWA, C.-L. TIEN, B. X. WANG**

**VOLUME CONTENTS AND AUTHOR INDEX
VOLUME 32, 1989**

PERGAMON PRESS
**OXFORD · NEW YORK · BEIJING · FRANKFURT
SÃO PAULO · SYDNEY · TOKYO · TORONTO**

INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER

BOARD OF EDITORS

R. ECHIGO (Associate Editor), Dept. of Mechanical Engineering, Tokyo Institute of Technology, Ohokayama 2-12-1, Meguro-ku, Tokyo 152, Japan

J. GOSSE, C.N.A.M., 292 rue Saint-Martin, 75141—Paris Cedex 03, France

U. GRIGULL, Technische Universität, Arcisstrasse 21, München, Germany

E. HAHNE (Co-Editor), Institut für Thermodynamik und Wärmetechnik, Pfaffenwaldring 6, D-7000 Stuttgart 80, Germany

J. P. HARTNETT, Energy Resources Center, University of Illinois, Box 4348, Chicago, Illinois 60680, U.S.A.

S. Y. KO (Associate Editor), Institute of Engineering Thermophysics, Chinese Academy of Sciences, PO Box 2706, Beijing 100080, China

O. G. MARTYNENKO, Heat and Mass Transfer Institute, Byelorussian Academy of Sciences, 25 Podlesnaya, Minsk, B.S.S.R., U.S.S.R.

W. J. MINKOWYCZ (Co-Editor), Dept. of Mechanical Engineering, University of Illinois, Box 4348, Chicago, Illinois 60680, U.S.A.

B. R. PAI (Associate Editor), National Aeronautical Laboratory, Post Bag No. 1779, Bangalore—560017, India

D. B. SPALDING, Bakery House, 40 High Street, Wimbledon, London SW19 5AU, U.K.

I. TANASAWA, Institute of Industrial Science, University of Tokyo, 7-22-1 Roppongi, Minato-ku, Tokyo 106, Japan

C.-L. TIEN, University of California, Irvine, California 92717, U.S.A.

B. X. WANG, Thermal Engineering Dept., Tsinghua University, Beijing 100084, China

HONORARY EDITORIAL ADVISORY BOARD

Chairman: E. R. G. ECKERT, *University of Minnesota, Minneapolis, Minnesota* 55455, *U.S.A.*

Past-Chairman: OWEN SAUNDERS, F.R.S., *Imperial College, London, U.K.*

Founding Editor: C. GAZLEY, JR., *The RAND Corporation, Santa Monica, California* 90406, *U.S.A.*

F. J. BAYLEY, *Sussex*
A. E. BERGLES, *Troy*
F. BOŠNJAKOVIĆ, *Stuttgart*
B. T. CHAO, *Urbana*
J. A. CLARK, *Ann Arbor*
M. COMBARNOUS, *Bordeaux*
I. CURIEVICI, *Iasi*
D. A. DE VRIES, *Helmond*
J. J. D. DOMINGOS, *Lisbon*
R. V. DUNKLE, *Melbourne*
D. K. EDWARDS, *Irvine*
Y. FUJITA, *Fukuoka*
B. GEBHART, *Philadelphia*
O. A. GERASHCHENKO, *Kiev*
R. J. GOLDSTEIN, *Minneapolis*
P. GRASSMAN, *Zürich*
A. A. GUKHMAN, *Moscow*
W. B. HALL, *Manchester*
G. F. HEWITT, *Harwell*
T. W. HOFFMANN, *Hamilton*
T. F. IRVINE, JR., *Stony Brook*
S. KAKAC, *Miami*
Y. KATTO, *Tokyo*
W. M. KAYS, *Stanford*
A. I. LEONTIEV, *Moscow*
J. MATHIEU, *Ecully*
F. MAYINGER, *Munich*
M. D. MIKHAILOV, *Sofia*
Yu. A. MIKHAILOV, *Riga*
Y. MORI, *Tokyo*
I. L. MOSTINSKY, *Moscow*
L. G. NAPOLITANO, *Naples*
R. I. NIGMATULIN, *Moscow*
F. OGINO, *Kyoto*
T. D. PATTEN, *Edinburgh*
J. R. A. PEARSON, *London*
G. D. RAITHBY, *Waterloo*
A. RAMACHANDRAN, *Nairobi*
J. F. RICHARDSON, *Swansea*
W. M. ROHSENOW, *Cambridge, Mass.*
J. J. RONCO, *La Plata*
R. H. SABERSKY, *Pasadena*
J. SCHNELLER, *Bechovice*
R. A. SEBAN, *Berkeley*
R. SEMERIA, *Grenoble*
R. K. SHAH, *Lockport*
S. SIDEMAN, *Haifa*
R. S. SILVER, *Glasgow*
M. SILVESTRI, *Milan*
H. SIMPSON, *Glasgow*
E. M. SPARROW, *Minneapolis*
K. STEPHAN, *Stuttgart*
M. A. STYRIKOVICH, *Moscow*
K. SUZUKI, *Kyoto*
M. G. VELARDE, *Madrid*
R. VISKANTA, *West Lafayette*
D. VORTMEYER, *Munich*
J. W. WESTWATER, *Urbana*
S. M. YANG, *Shanghai*
A. A. ZHUKAUSKAS, *Vilnius*

Subscription Rates 1990

Annual institutional subscription rate (1990) DM 1780.00. Two-year institutional rate (1990/91) DM 3382.00. Personal subscription rate for those whose library subscribes at the regular rate (1990) DM 189.00. Prices are subject to change without notice. Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, U.S.A., and for the remainder of the world to: Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, U.K.

Back Issues

Back issues of all previously published volumes are available direct from Pergamon Press offices.

Published monthly

Copyright © Pergamon Press plc 1989

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying Information for Users in the U.S.A. The Item-Fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying, beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-Fee Code for this publication is: 0017–9310/89 $3.00 + 0.00

♾™ The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

VOLUME CONTENTS

January

Win Aung, T. Y. Chu, E. R. G. Eckert, J. P. Hartnett, W. E. Ibele, F. A. Kulacki, W. J. Minkowycz and R. L. Webb	1	Professor Richard J. Goldstein on his 60th birthday
V. K. Pustovalov and D. S. Bobuchenko	3	Heating, evaporation and combustion of a solid aerosol particle in a gas exposed to optical radiation
G. P. Yogesh and B. N. Raghunandan	19	Flow structure and heat transfer characteristics behind a diaphragm in the presence of a diffusion flame
N. L. Vulchanov and V. D. Zimparov	29	Stabilized turbulent fluid friction and heat transfer in circular tubes with internal sand type roughness at moderate Prandtl numbers
A. H. Dilawari, J. Szekely, J. F. Coudert and P. Fauchais	35	Fluid flow and heat transfer in plasma reactors—II. A critical comparison of experimentally measured and theoretically predicted temperature profiles in plasma jets in the absence and presence of side-stream injection
M. S. Christenson and F. P. Incropera	47	Solidification of an aqueous ammonium chloride solution in a rectangular cavity—I. Experimental study
M. S. Christenson, W. D. Bennon and F. P. Incropera	69	Solidification of an aqueous ammonium chloride solution in a rectangular cavity—II. Comparison of predicted and measured results
R. F. Richards and D. K. Edwards	81	Effect of boundary radiation on thermal stability in horizontal layers
R. L. Frederick	87	Natural convection in an inclined square enclosure with a partition attached to its cold wall
S. C. Yao and T. H. Hwang	95	Critical heat flux on horizontal tubes in an upward crossflow of Freon-113
G. J. Yoo and R. M. C. So	105	Variable density effects on axisymmetric sudden-expansion flows
S. Hirai, T. Takagi and T. Higashiya	121	Numerical prediction of flow characteristics and retardation of mixing in a turbulent swirling flow

D. S. JUNG, M. MCLINDEN, R. RADERMACHER and D. DIDION — 131 Horizontal flow boiling heat transfer experiments with a mixture of R22/R114

R. A. W. M. HENKES and C. J. HOOGENDOORN — 147 Laminar natural convection boundary-layer flow along a heated vertical plate in a stratified environment

R. A. W. M. HENKES and C. J. HOOGENDOORN — 157 Comparison of turbulence models for the natural convection boundary layer along a heated vertical plate

D. NAYLOR, H. M. BADR and J. D. TARASUK — 171 Experimental and numerical study of natural convection between two eccentric tubes

Technical Notes

M. KUMARI and G. NATH — 183 Non-Darcy mixed convection boundary layer flow on a vertical cylinder in a saturated porous medium

V. K. GARG and K. VELUSAMY — 187 On the heat transfer from a cylindrical fin

S. KIMURA — 192 Transient forced convection heat transfer from a circular cylinder in a saturated porous medium

Book Reviews

W. M. KAYS — 197 Heat Transfer in Gas-cooled Annular Channels, by J. VILEMAS, B. CESNA and V. SURVILA

K. A. PERICLEOUS — 197 Computational Fluid Dynamics, by TARIT KUMAR BOSE

Announcement

199 Eighth Eurotherm Seminar on 'Advances in Pool Boiling Heat Transfer', Paderborn, Federal Republic of Germany, 11–12 May 1989

February

M. M. OHADI and E. M. SPARROW — 201 Heat transfer in a straight tube situated downstream of a bend

K. EL KHOURY et A. NEVEU — 213 Analyse modale des systèmes thermiques en présence de transferts non-réciproques

M. V. FYODOROV and V. V. KLIMENKO — 227 Vapour bubble growth in boiling under quasi-stationary heat transfer conditions in a heating wall

C. GUIGLION, S. DOMENECH et L. PIBOULEAU — 243 Récupération optimale de l'énergie dans les réseaux d'échangeurs de chaleur—I. Etude théorique

C. GUIGLION, S. DOMENECH, L. PIBOULEAU et M. BELKEBIR — 251 Récupération optimale de l'énergie dans les réseaux d'échangeurs de chaleur—II. Etude de cas particuliers et classification des réseaux possibles

M. T. OUAZZANI, J. P. CALTAGIRONE, G. MEYER et A. MOJTABI — 261 Etude numérique et expérimentale de la convection mixte entre deux plans horizontaux à températures différentes

E. ACHENBACH — 271 Heat transfer from a staggered tube bundle in cross-flow at high Reynolds numbers

A. FAGHRI, M.-M. CHEN and E. T. MAHEFKEY — 281 — Simultaneous axial conduction in the fluid and the pipe wall for forced convective laminar flow with blowing and suction at the wall

R. TURTON, T. J. FITZGERALD and O. LEVENSPIEL — 289 — An experimental method to determine the heat transfer coefficient between fine fluidized particles and air via changes in magnetic properties

P. CHEN and D. C. T. PEI — 297 — A mathematical model of drying processes

S. C. LEE — 311 — Effect of fiber orientation on thermal radiation in fibrous media

E. R. G. ECKERT and J. N. SHADID — 321 — Viscous heating of a cylinder with finite length by a high viscosity fluid in steady longitudinal flow—1. Newtonian fluids

C.-H. HO and M. N. ÖZIŞIK — 335 — An inverse radiation problem

N. B. KAMPP RASMUSSEN, P. T. JENSEN and S. HADVIG — 343 — Numerical integration method of radiative exchange (NIMREX)

B. W. JONES and M. GOLSHEKAN — 351 — Destratification and other properties of a packed bed heat store

W. J. MARSH and I. MUDAWAR — 361 — Predicting the onset of nucleate boiling in wavy free-falling turbulent liquid films

I. MUDAWAR and D. E. MADDOX — 379 — Critical heat flux in subcooled flow boiling of fluorocarbon liquid on a simulated electronic chip in a vertical rectangular channel

Y. ASAKO and M. FAGHRI — 395 — Three-dimensional heat transfer analysis of arrays of heated square blocks

Book Reviews

H. BRANOVER — 407 — Heat and Mass Transfer in MHD Flows, by E. BLUMS, YU. A. MIKHAILOV and R. OZOLS

D. G. TATCHELL — 408 — Handbook of Single-phase Convective Heat Transfer, edited by SADIK KAKAÇ, RAMESH K. SHAH and WIN AUNG

March

W. J. MINKOWYCZ, E. M. SPARROW, E. R. G. ECKERT, R. J. GOLDSTEIN and T. F. IRVINE, JR. — i — Professor James P. Hartnett on his 65th birthday

R. SCARICABAROZZI — 409 — Une méthode numérique non itérative pour la détermination du régime de fonctionnement périodique des régénérateurs

S. SUBBIAH, D. L. TRAFFORD and S. I. GÜÇERI — 415 — Non-isothermal flow of polymers into two-dimensional, thin cavity molds: a numerical grid generation approach

R. VASANTHA and G. NATH	435	Semi-similar solutions of the unsteady compressible second-order boundary layer flow at the stagnation point
D. B. R. KENNING and M. G. COOPER	445	Saturated flow boiling of water in vertical tubes
M. G. COOPER	459	Flow boiling—the 'apparently nucleate' regime
A. HILL and A. J. WILLMOTT	465	Accurate and rapid thermal regenerator calculations
A. SOUFIANI and J. TAINE	477	Experimental and theoretical studies of combined radiative and convective transfer in CO_2 and H_2O laminar flows
L. N. TAO	487	The heat conduction problem with temperature-dependent material properties
I. POP, P. CHENG and T. LE	493	Leading edge effects on free convection of a Darcian fluid about a semi-infinite vertical plate with uniform heat flux
D. R. SHONNARD and S. WHITAKER	503	The effective thermal conductivity for a point-contact porous medium: an experimental study
N. Y. LEE, W. W. SCHULTZ and J. P. BOYD	513	Stability of fluid in a rectangular enclosure by spectral method
O. A. GERASHCHENKO and V. L. KREMENCHUGSKY	521	A thermopyroelectric infra-red detector
W.-J. CHANG and J.-Y. JANG	529	Non-Darcian effects on vortex instability of a horizontal natural convection flow in a porous medium
W.-J. CHANG and J.-Y. JANG	541	Inertia effects on vortex instability of a horizontal natural convection flow in a saturated porous medium
G. REICH and H. BEER	551	Fluid flow and heat transfer in an axially rotating pipe—I. Effect of rotation on turbulent pipe flow
G. REICH, B. WEIGAND and H. BEER	563	Fluid flow and heat transfer in an axially rotating pipe—II. Effect of rotation on laminar pipe flow
B. SUNDEN	575	Transient conduction in a cylindrical shell with a time-varying incident surface heat flux and convective and radiative surface cooling
J. S. M. BOTTERILL, A. G. SALWAY and Y. TEOMAN	585	The effective thermal conductivity of high temperature particulate beds—I. Experimental determination
J. S. M. BOTTERILL, A. G. SALWAY and Y. TEOMAN	595	The effective thermal conductivity of high temperature particulate beds—II. Model predictions and the implication of the experimental values
Technical Notes		
P. A. A. LAURA and V. H. CORTINEZ	611	An extension of the Kantorovich method and its application to a steady state heat conduction problem

J. BAKER-JARVIS — 613 Two temperature, two phase heat transfer in porous media: solution to linear models

S. KIMURA — 617 Transient forced and natural convection heat transfer about a vertical cylinder in a porous medium

N. SELÇUK — 620 Evaluation of flux models for radiative transfer in cylindrical furnaces

April

J. P. HARTNETT — 625 In Memoriam—Dr Carl Gazley, Jr.

D. G. GOODWIN and M. MITCHNER — 627 Flyash radiative properties and effects on radiative heat transfer in coal-fired systems

G. P. CELATA, M. CUMO, G. E. FARELLO and G. FOCARDI — 639 A comprehensive analysis of direct contact condensation of saturated steam on subcooled liquid jets

H. J. H. BROUWERS — 655 Film condensation on non-isothermal vertical plates

S. J. KIM and K. VAFAI — 665 Analysis of natural convection about a vertical plate embedded in a porous medium

T. L. BERGMAN and R. SRINIVASAN — 679 Numerical simulation of Soret-induced double diffusion in an initially uniform concentration binary liquid

W.-S. YEUNG — 689 Engineering analysis of heat transfer during melting in vertical rectangular enclosures

K. KAPOOR and Y. JALURIA — 697 Heat transfer from a negatively buoyant wall jet

Y. N. LEE and W. J. MINKOWYCZ — 711 Heat transfer characteristics of the annulus of two-coaxial cylinders with one cylinder rotating

P. K. TEWARI, R. K. VERMA, M. P. S. RAMANI, A. CHATTERJEE and S. P. MAHAJAN — 723 Nucleate boiling in a thin film on a horizontal tube at atmospheric and subatmospheric pressures

S. P. DETKOV and O. A. BRYUKHOVSKIKH — 729 Transformation of the data base to calculate the relation characteristics of steam

R. KUMAR — 735 Laboratory studies of thermal convection in the interface under a stable layer

A. BEJAN and P. A. LITSEK — 751 The contact heating and lubricating flow of a body of glass

O. J. ILEGBUSI — 761 Turbulent boundary layer on a porous flat plate with severe injection at various angles to the surface

O. J. ILEGBUSI and D. B. SPALDING — 767 Prediction of fluid flow and heat transfer characteristics of turbulent shear flows with a two-fluid model of turbulence

Technical Notes

W. M. YAN, Y. L. TSAY and T. F. LIN — 775 Transient conjugated heat transfer in laminar pipe flows

V. VILIMPOC, T. CHEN, R. COLE and F. C. SUKANEK — 778 A method for determining the thermal diffusivity of fluids

R. S. GUPTA and N. C. BANIK — 781 Approximate method for the oxygen diffusion problem

May

I. TANASAWA and R. ECHIGO — 785 Heat transfer bibliography—Japanese works

TAN HE PING and M. LALLEMAND — 795 Transient radiative–conductive heat transfer in flat glasses submitted to temperature, flux and mixed boundary conditions

E. NAITO and Y. NAGANO — 811 The effect of buoyancy on downward and upward laminar-flow convection in the entrance region between inclined parallel plates

S. S. CHA, R. K. AHLUWALIA and K. H. IM — 825 Boundary layer nucleation

M. S. SMIRNOV and V. I. LYSENKO — 837 Equations of drying curves

D. W. MACKOWSKI — 843 Photophoresis of aerosol particles in the free molecular and slip-flow regimes

D. J. CLOSE and J. SHERIDAN — 855 Natural convection in enclosures filled with a vapour and a non-condensing gas

Y. H. HUNG and W. M. SHIAU — 863 An effective model for measuring transient natural convective heat flux in vertical parallel plates with a rectangular rib

D. VORTMEYER, N. RUDRAIAH and T. P. SASIKUMAR — 873 Effect of radiative transfer on the onset of convection in a porous medium

K. MURALIDHAR — 881 Mixed convection flow in a saturated porous annulus

S. G. RAVIKUMAUR, K. N. SEETHARAMU and P. A. ASWATHA NARAYANA — 889 Performance evaluation of crossflow compact heat exchangers using finite elements

G. EVANS and R. GREIF — 895 A study of traveling wave instabilities in a horizontal channel flow with applications to chemical vapor deposition

D. Y. TZOU — 913 Stochastic modelling for contact problems in heat conduction

R. A. PEATTIE and R. BUDWIG — 923 Heat transfer in laminar, oscillatory flow in cylindrical and conical tubes

NAI-YI LI and J. R. BARBER — 935 Sinusoidal perturbation solutions for planar solidification

J. R. BARBER — 943 An asymptotic solution for short-time transient heat conduction between two similar contacting bodies

R. A. BREWSTER and T. F. IRVINE, JR. 951 Laminar mixed convection in power law fluids in continuous flow electrophoresis systems

M. KRARTI 961 Steady-state heat transfer beneath partially insulated slab-on-grade floor

Technical Notes

F. C. LAI and F. A. KULACKI 971 Thermal dispersion effects on non-Darcy convection over horizontal surfaces in saturated porous media

D. C. LOOK, JR. 977 Two-dimensional fin with non-constant root temperature

Announcement

981 Third International Conference on Laser Anemometry, Advances and Applications, University of Swansea, Wales, U.K., 26–29 September 1989

983 Errata

June

O. G. MARTYNENKO 985 Heat and mass transfer bibliography—Soviet works

D. MORVAN and M. Y. JAFFRIN 995 Unsteady diffusion mass transfer in a microencapsulated islet of Langerhans for a bioartificial pancreas

M. E. THOMPSON and J. SZEKELY 1007 The transient behavior of weldpools with a deformed free surface

M. E. THOMPSON and J. SZEKELY 1021 Density stratification due to counterbuoyant flow along a vertical crystallization front

G. PAGLIARINI 1037 Steady laminar heat transfer in the entry region of circular tubes with axial diffusion of heat and momentum

P. BADER 1053 Pressure and thermal effects in liquid metal due to collapse of external magnetic field

Z. ZHANG and A. BEJAN 1063 Melting in an enclosure heated at constant rate

H. MCCANN, L. J. CLARKE and A. P. MASTERS 1077 An experimental study of vapour growth at the superheat limit temperature

YU. E. KARYAKIN 1095 Transient natural convection in prismatic enclosures of arbitrary cross-section

A. ULLMANN and H. KALMAN 1105 Efficiency and optimized dimensions of annular fins of different cross-section shapes

I. KECECIOGLU and B. RUBINSKY 1111 A continuum model for the propagation of discrete phase-change fronts in porous media in the presence of coupled heat flow, fluid flow and species transport processes

J. GOUNOT et J. P. CALTAGIRONE 1131 Stabilité et convection naturelle au sein d'une couche poreuse non homogène

P. KOUTMOS and J. J. MCGUIRK — 1141 Turbofan forced mixer/nozzle temperature and flow field modelling

W. SHYY, M. E. BRAATEN and D. L. BURRUS — 1155 Study of three-dimensional gas-turbine combustor flows

R. P. TAYLOR, H. W. COLEMAN, M. H. HOSNI and P. H. LOVE — 1165 Thermal boundary condition effects on heat transfer in the turbulent incompressible flat plate boundary layer

G. S. H. LOCK and Y. LIU — 1175 The effect of geometry on the performance of the closed tube thermosyphon at low Rayleigh numbers

Technical Notes

S. KABELAC — 1183 The transient response of finned crossflow heat exchangers

J. SUCEC — 1189 Approximate analytical solution to forced convection with arbitrary surface heat flux

M. KUROSAKA, J. E. GRAHAM and J. S. SHANG — 1192 Negative heat transfer in separated flows

July

W.-J. YANG, K. H. GUO and T. UEMURA — 1197 Theory and experiments on evaporating sessile drops of binary liquid mixtures

A. POZZI and M. LUPO — 1207 The coupling of conduction with forced convection over a flat plate

A. POZZI and M. LUPO — 1215 The coupling of conduction with forced convection in a plane duct

YU. T. GLAZUNOV — 1223 Development of the method of generalized coordinates for solving non-linear non-stationary combined heat and mass transfer problems with complex boundary conditions

Y. MORI and M. OHBUCHI — 1231 A fundamental study of flow and heat transfer performances of downward water flow at low Reynolds numbers in a vertical heated straight tube

M. H. KIM and M.-U. KIM — 1239 Natural convection near a rectangular corner formed by two vertical flat plates with uniform surface heat flux

J.-P. LAURENT — 1247 Evaluation des paramètres thermiques d'un milieu poreux: optimisation d'outils de mesure "*in situ*"

K. VAFAI and H. C. TIEN — 1261 A numerical investigation of phase change effects in porous materials

Y. CAO, A. FAGHRI and E. T. MAHEFKEY — 1279 The thermal performance of heat pipes with localized heat input

Y. CAO, A. FAGHRI and W. S. CHANG — 1289 A numerical analysis of Stefan problems for generalized multi-dimensional phase-change structures using the enthalpy transforming model

M. M. MEGAHED, M. N. SAEED, M. M. SOROUR and M. B. MADI — 1299 — Unsteady vaporization of stationary dodecane and alcohol droplets suspended in a hot non-reactive environment

T.-Y. WANG and C. KLEINSTREUER — 1309 — Mixed convection over rotating bodies with blowing and suction

S.-H. KIM and M. S. EL-GENK — 1321 — Heat transfer experiments for low flow of water in rod bundles

C. PAN, J. Y. HWANG and T. L. LIN — 1337 — The mechanism of heat transfer in transition boiling

X. S. WANG, Z. DAGAN and L. M. JIJI — 1351 — Heat transfer between a circular free impinging jet and a solid surface with non-uniform wall temperature or wall heat flux—1. Solution for the stagnation region

X. S. WANG, Z. DAGAN and L. M. JIJI — 1361 — Heat transfer between a circular free impinging jet and a solid surface with non-uniform wall temperature or wall heat flux—2. Solution for the boundary layer region

Technical Notes

S. S. DOSANJH — 1373 — Melt propagation in porous media

T. MAEKAWA and I. TANASAWA — 1377 — Effect of magnetic field and buoyancy on onset of Marangoni convection

R. L. MAHAJAN and B. GEBHART — 1380 — Viscous dissipation effects in buoyancy induced flows

P. R. CHAPPIDI and F. S. GUNNERSON — 1383 — Analysis of heat and momentum transport along a moving surface

Announcement

1387 — Third International PHOENICS User Conference, Dubrovnik, Yugoslavia, 28 August–1 September 1989

August

V. M. IYEVLEV, B. V. DZYUBENKO, G. A. DREITSER and V. V. BALASHOV — 1389 — Unsteady-state heat and mass transfer in complex-shaped channels

A. D. POLYANIN, V. A. ALVARES-SUARES, V. V. DIL'MAN and YU. S. RYAZANTSEV — 1401 — Experimental data processing by means of 'asymptotic coordinates'

D. G. WANG, S. S. SADHAL and C. S. CAMPBELL — 1413 — Particle rotation as a heat transfer mechanism

P. TERVOLA — 1425 — A method to determine the thermal conductivity from measured temperature profiles

J. J. HECKEL, T. S. CHEN and B. F. ARMALY — 1431 — Mixed convection along slender vertical cylinders with variable surface temperature

T. SKIEPKO — 1443 — Effect of parameter values on gas and matrix temperature fields in rotary heat exchangers

W. K. P. VAN LOON, I. A. VAN HANEGHEM and J. SCHENK 1473 A new model for the non-steady-state probe method to measure thermal properties of porous media

A. M. JACOBI and V. W. GOLDSCHMIDT 1483 The effect of surface tension variation on filmwise condensation and heat transfer on a cylinder in cross flow

M. MOLKI and A. R. MOSTOUFIZADEH 1491 Turbulent heat transfer in rectangular ducts with repeated-baffle blockages

M. PRUD'HOMME et T. H. NGUYEN 1501 Solutions par perturbations singulières pour un problème de Stefan généralisé

K. S. BALL, B. FAROUK and V. C. DIXIT 1517 An experimental study of heat transfer in a vertical annulus with a rotating inner cylinder

S. BEN NASRALLAH et G. ARNAUD 1529 Etude des transferts bidimensionnels de chaleur et de masse lors du séchage par convection naturelle d'une plaque poreuse verticale chauffée par un flux constant

S. S. FINNICUM and J. W. WESTWATER 1541 Dropwise vs filmwise condensation of steam on chromium

M. BRAHIMI, L. DEHMANI et DOAN-KIM-SON 1551 Structure turbulente de l'écoulement d'interaction de deux panaches thermiques

A. M. CLAUSING, L. D. LISTER and J. M. WALDVOGEL 1561 Combined convection from isothermal cubical cavities with a variety of side-facing apertures

A. VALENCIA and R. L. FREDERICK 1567 Heat transfer in square cavities with partially active vertical walls

K. S. DOMINGUEZ and J. R. WYNNYCKYJ 1575 Spectral emissivity measurement

Technical Notes

W. M. YAN, Y. L. TSAY and T. F. LIN 1581 Combined heat and mass transfer in turbulent natural convection between vertical parallel plates

C.-Y. WU 1585 Hyperbolic heat conduction with surface radiation and reflection

Book Review

R. I. NIGMATULIN 1589 Methods of Model Equations and Analogies in Chemical Engineering, by V. V. DIL'MAN and A. D. POLYANIN

1591 Erratum

September

M. SHOJI, R. ECHIGO and I. TANASAWA 1593 Professor Yoshiro Katto on his 65th birthday

V. A. BORODULYA, YU. S. TEPLITSKY, YU. G. YEPANOV and I. I. MARKEVICH 1595 Heat transfer between a surface and an infiltrated bed of solid particles

B. ABRAMZON and W. A. SIRIGNANO 1605 Droplet vaporization model for spray combustion calculations

J. C. HAN, S. OU, J. S. PARK and C. K. LEI	1619	Augmented heat transfer in rectangular channels of narrow aspect ratios with rib turbulators
A. BEJAN	1631	Theory of heat transfer-irreversible refrigeration plants
T. NISHIMURA, F. NAGASAWA and Y. KAWAMURA	1641	Natural convection in horizontal enclosures with multiple partitions
A. ABBASSI and R. H. S. WINTERTON	1649	The non-boiling vapour film
Y.-H. JU, Y.-S. CHOU and C.-C. HSIAO	1657	A new approach to the transient conduction in a 2-D rectangular fin
T. HIRATA and K. NISHIDA	1663	An analysis of heat transfer using equivalent thermal conductivity of liquid phase during melting inside an isothermally heated horizontal cylinder
J. NEYMARK, C. R. BOARDMAN III, A. KIRKPATRICK and R. ANDERSON	1671	High Rayleigh number natural convection in partially divided air and water filled enclosures
H. Q. YANG and K. T. YANG	1681	Mixed convection from a heated inclined plate in a channel with application to CVD
F. J. HAMADY, J. R. LLOYD, H. Q. YANG and K. T. YANG	1697	Study of local natural convection heat transfer in an inclined enclosure
M. A. EBADIAN and H. Y. ZHANG	1709	An exact solution of extended Graetz problem with axial heat conduction
V. R. VOLLER, A. D. BRENT and C. PRAKASH	1719	The modelling of heat, mass and solute transport in solidification systems
S. SOMASUNDARAM, N. K. ANAND, Y. B. SUH and W. AUNG	1733	Analysis of moisture migration in two-dimensional unsaturated porous media with impermeable boundaries
K. TAGHAVI and W. M. B. DUVAL	1741	Inverse heat transfer analysis of Bridgman crystal growth
D. S. JUNG, M. MCLINDEN, R. RADERMACHER and D. DIDION	1751	A study of flow boiling heat transfer with refrigerant mixtures
H. K. WEE, R. B. KEEY and M. J. CUNNINGHAM	1765	Heat and moisture transfer by natural convection in a rectangular cavity
D. J. NELSON and B. D. WOOD	1779	Combined heat and mass transfer natural convection between vertical parallel plates

Technical Notes

D. J. NELSON and B. D. WOOD	1789	Fully developed combined heat and mass transfer natural convection between parallel plates with asymmetric boundary conditions
V. PRASAD, N. KLADIAS, A. BANDYOPADHAYA and Q. TIAN	1793	Evaluation of correlations for stagnant thermal conductivity of liquid-saturated porous beds of spheres
A. FAGHRI and R. A. SEBAN	1796	Heat and mass transfer to a turbulent falling film—II

October

E. Hahne, N. Shen and K. Spindler	1799	Fully developed nucleate boiling in upflow and downflow
A. Selamet and V. S. Arpaci	1809	Rayleigh limit–Penndorf extension
J. R. Riznic and M. Ishii	1821	Bubble number density and vapor generation in flashing flow
M. Ishii and K. Mishima	1835	Droplet entrainment correlation in annular two-phase flow
Wang Chaoyang and Tu Chuanjing	1847	The effect of non-condensable gas on forced convection condensation along a horizontal plate in a porous medium
S. O. Awonorin	1853	Film boiling characteristics of liquid nitrogen sprays on a heated plate
N. E. Wijeysundera, M. N. A. Hawlader and Y. T. Tan	1865	Water vapour diffusion and condensation in fibrous insulations
M. C. Smith, D. A. Haines and W. A. Main	1879	Growth of buoyancy-induced longitudinal vortex pairs in a laminar flow
J. Timmler and P. Roth	1887	Measurements of high temperature evaporation rates of solid and liquid aerosol particles
N. Brauner, D. Moalem Maron and H. Meyerson	1897	Coupled heat condensation and mass absorption with comparable concentrations of absorbate and absorbent
H. Herwig, M. Voigt and F.-J. Bauhaus	1907	The effect of variable properties on momentum and heat transfer in a tube with constant wall temperature
H. C. Ünal	1917	Temperature distribution in a plate with temperature-dependent thermal conductivity and internal heat generation
Y. K. Wu, M. Prud'homme et T. Hung Nguyen	1927	Étude numérique de la fusion autour d'un cylindre vertical soumis à deux types de conditions limites
H. Ozoe and K. Okada	1939	The effect of the direction of the external magnetic field on the three-dimensional natural convection in a cubical enclosure
R. Siegel	1955	Some aspects of transient cooling of a radiating rectangular medium
A. E. McLeod and E. H. Bishop	1967	Turbulent natural convection of gases in horizontal cylindrical annuli at cryogenic temperatures
Da Yu Tzou	1979	Shock wave formation around a moving heat source in a solid with finite speed of heat propagation

Technical Notes

S. L. LEE and K. HSU — 1989 — Interaction of surface suction/blowing with buoyancy force on mixed convection flow adjacent to an inclined flat plate

Y. SEZEN — 1992 — Internal mass transfer considerations during the pyrolysis of an isolated spherical softening coal particle

G. F. JONES — 1997 — A note on the inverse problem of radial diffusion in a semi-infinite porous medium

J. BELLAN and K. HARSTAD — 2000 — Transport-related phenomena for clusters of drops

Letter to the Editors

E. F. ADIUTORI — 2003 — On the chronology of progress on thermal stability

November

W. DUDZIAK and S. J. KOWALSKI — 2005 — Theory of thermodiffusion for solids

A. BELGHIT and M. DAGUENET — 2015 — Study of heat and mass transfer in a chemical moving bed reactor for gasification of carbon using an external radiative source

Y. CHANG, A. N. BERIS and E. E. MICHAELIDES — 2027 — A numerical study of heat and momentum transfer for flexible tube bundles in cross flow

K. BREMHORST, L. KREBS, U. MÜLLER and J. B. H. LISTIJONO — 2037 — Application of a gradient diffusion and dissipation time scale ratio model for prediction of mean and fluctuating temperature fields in liquid sodium downstream of a multi-bore jet block

J. HUTCHINS and E. MARSCHALL — 2047 — Pseudosteady-state natural convection heat transfer inside spheres

A. CLAUSSE, R. T. LAHEY, JR. and M. PODOWSKI — 2055 — An analysis of stability and oscillation modes in boiling multichannel loops using parameter perturbation methods

S.-L. LEE — 2065 — Weighting function scheme and its application on multidimensional conservation equations

A. V. HASSANI and K. G. T. HOLLANDS — 2075 — Prandtl number effect on external natural convection heat transfer from irregular three-dimensional bodies

JAE MIN HYUN and KI MOON IN — 2081 — Stratifying process of a fluid in an enclosure with a time-varying vertical through-flow

A. M. LEITCH — 2087 — Evolution of a binary system crystallizing in a confined region

S. DEB and S. C. YAO — 2099 — Analysis on film boiling heat transfer of impacting sprays

Y. H. HWANG and Y. H. HUNG — 2113 — Turbulent transport phenomena in three-dimensional side-dump ramjet combustors

V. G. CHERNYAK and A. YE. MARGILEVSKIY — 2127 — The kinetic theory of heat and mass transfer from a spherical particle in a rarefied gas

G. LAURIAT and V. PRASAD — 2135 — Non-Darcian effects on natural convection in a vertical porous enclosure

A. A. KENDOUSH — 2149 — The delay time during depressurization of saturated water

A. A. MOHAMAD and R. VISKANTA — 2155 — Stability of lid-driven shallow cavity heated from below

D. B. INGHAM and I. POP — 2167 — Natural convection in a right-angle corner: higher-order analysis

TANG WONG and D. D. FREY — 2179 — Matrix calculation of multicomponent transient diffusion in porous sorbents

X. S. WANG, Z. DAGAN and L. M. JIJI — 2189 — Conjugate heat transfer between a laminar impinging liquid jet and a solid disk

H. Q. YANG, K. T. YANG and Q. XIA — 2199 — Periodic laminar convection in a tall vertical cavity

Announcement

2209 — Multiphase Flow and Heat Transfer: Bases and Applications in: (A) The Nuclear Power Industry; (B) The Process Industries, Zurich, Switzerland, 19–23 March 1990

December

E. R. G. ECKERT, R. J. GOLDSTEIN, E. PFENDER, W. E. IBELE, S. V. PATANKAR, T. W. SIMON, N. A. DECKER, H. LEE, S. L. GIRSHICK, C. J. SCOTT, P. J. STRYKOWSKI and K. K. TAMMA — 2211 — Heat transfer—a review of 1988 literature

O. G. MARTYNENKO — 2281 — Heat and mass transfer bibliography—Soviet works

J. BANDROWSKI and J. ZIOŁO — 2291 — Heat and mass transfer bibliography—Polish works (1987–1988)

O. G. MARTYNENKO, V. N. KOROVKIN and YU. A. SOKOVISHIN — 2297 — The class of self-similar solutions for laminar buoyant jets

O. G. MARTYNENKO, V. N. KOROVKIN and YU. A. SOKOVISHIN — 2309 — A swirled jet problem

G. Z. GERSHUNI, E. M. ZHUKHOVITSKY, A. K. KOLESNIKOV and YU. S. YURKOV — 2319 — Vibrational convection in a horizontal fluid layer with internal heat sources

I. V. DEREVICH, V. M. YEROSHENKO and L. I. ZAICHIK — 2329 — Hydrodynamics and heat transfer of turbulent gas suspension flows in tubes—1. Hydrodynamics

I. V. Derevich, V. M. Yeroshenko and L. I. Zaichik 2341 Hydrodynamics and heat transfer of turbulent gas suspension flows in tubes—2. Heat transfer

M. Ilic and I. W. Turner 2351 Convective drying of a consolidated slab of wet porous material

W. Marszałek and G. T. Kekkeris 2363 Heat exchangers and linear image processing theory

J. Lu and R. Qian 2375 A modelling study to the heat transfer between immersed surfaces and large-particle fluidized beds

J.-P. Praizey 2385 Benefits of microgravity for measuring thermotransport coefficients in liquid metallic alloys

H. E. Alpay and F. Balkan 2403 Nucleate pool boiling performance of acetone–ethanol and methylene chloride–ethanol binary mixtures

K. H. Lie, D. N. Riahi and J. S. Walker 2409 Buoyancy and surface tension driven flows in float zone crystal growth with a strong axial magnetic field

C. Y. C. Lee and B. Rubinsky 2421 A multi-dimensional model of momentum and mass transfer in the liver

D. S. Jung and R. Radermacher 2435 Prediction of pressure drop during horizontal annular flow boiling of pure and mixed refrigerants

Z. Zhang and A. Bejan 2447 The problem of time-dependent natural convection melting with conduction in the solid

M. Cohen and V. P. Carey 2459 A comparison of the flow boiling performance characteristics of partially-heated cross-ribbed channels with different rib geometries

J. A. Domaradzki 2475 Heat transfer enhancement in Rayleigh–Benard convection

N. Filatoff and A. Lasek 2485 On variable viscosity magma flow

2493 Corrigendum

i Volume Contents and Author Index for Volume 32, 1989